DRIPPING CRYSTALS

Objectives:

Students will:

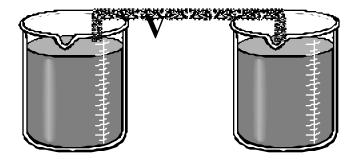
- investigate deposition, the process that allows growth of different secondary cave formations.
- recognize that different chemical compounds produce different speleothem types,
- identify several speleothems.

Materials:

- 2 pieces of cotton yarn or string
- 4 jars or cups of the same size
- 2 saucers
- Epsom salts
- baking soda (sodium bicarbonate) washing soda (sodium carbonate) can also be used
- warm water
- spoon or coffee stirrer
- several books and internet sites about caves and speleothems see *Internet Sites Related* to Caves and Karst



- 1. Tell the students that they will be conducting an experiment that will demonstrate how water can deposit minerals to create cave formations, or "speleothems" (secondary mineral deposits formed in caves).
- 2. Ask the students if they have ever seen stalactites or stalagmites. Do they know which is which? Stalactites hang tight to the ceiling and stalagmites come up from the ground and might reach the ceiling someday. How do they form? Discuss how water can carry calcite in solution then deposit the calcite in crystalline form in a cave. If necessary use sugar, salt, Jell-O, or Kool-Aid as examples of minerals dissolving into solution.
- 3. Explain that the process would take millions of years in a cave. The students will speed up the process in the classroom by using a concentrated solution and sunlight (to aid evaporation).
- 4. Students may create the set-up, help with it, or watch as you complete the steps. If the students created the set up have them work in small groups. Procedure:
 - Dissolve as much Epsom salt (or washing soda) as you can in two jars or cups half full of very warm water.
 - Soak a piece of string (yarn) in the solution. Lay the yarn on the jars so that both ends are well inside the solution in each jar and the middle is over the saucer with a slight dip in the middle. (Epsom salt creates better popcorn type crystals, washing soda is harder to find, but makes better stalactites.)
 - Put just a touch of dry Epsom salt or washing soda on the saucer. Leave the jars for several days.



- 5. The solution in the jars will drip onto the saucer, creating a stalactite and stalagmite, and eventually a "column" (when they grow together). Hopefully this will occur... it doesn't happen every time.
- 6. Set up the second set of jars at the same time, using baking soda instead of Epsom salt. Within 48 hours, the students will notice that the crystals look very different in comparison. The baking soda will form delicate "popcorn" formations along the string.
- 7. As the students check their experiment each day, discuss the differences between the baking soda and Epsom salt deposits. Why are they different?
- 10. Discuss what happens when carbonic acid degasses, as it drips or seeps out of a cave wall. Degassing is the process where the acid can no longer hold anything in solution and must deposit it. Why does this cause deposition of calcite?
- 11. Do you notice crystals in other places than at the dip in the string? Where and why?
- 12. What property of water allows the string to stay wet and drip water? (Osmosis)
- 13. Give the students time during class to look at the included reference materials. Have them familiarize themselves with the following formations: stalactite, stalagmite, soda straw, column, popcorn, frostwork, boxwork, and flowstone.
- 14. Watch the water level in the glasses and discuss formations (speleothems), water levels, groundwater and recharge. Notice the water level goes down and does not get refilled. Much of the water is being pulled into the yarn. Would this happen in a cave situation? (Yes, the water would drip and go further into the ground.) If there is no recharge, what will eventually happen? What would this mean to the cave system?

Hint:

Be careful with the Epsom salts. The crystals are very delicate. You will need to add quite a lot Epsom salts and make sure they are dissolved in solution. It will be several days before they crystallize on the string, but they should. If the formation gets heavy, it will break off. Watch the crystallization below the drip it can be rather interesting.